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# TRENDS AND ISSUES OF ELECTRONIC WASTE AND MOBILE PHONE WASTE: A REVIEW OF MALAYSIA CONTEXT

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## ABSTRACT

*For the past few decades, electrical and electronic equipment has transformed our daily activities dramatically. Although electrical and electronic equipment makes our life convenient, however, it will cause an environmental issue if it is not handled in appropriate disposal manner once those equipment reach end-of-life. Therefore, electronic waste and mobile phone waste has become a serious environmental issue in the 21st century. In this study, a review of the electronic waste and mobile phone waste in Malaysia will be conducted through the past academic literature and secondary data such as data from United Nation report, World Bank report, Department of Environment Malaysia report and Malaysian Communications and Multimedia Commision report. Meanwhile, the recommendation section will be provided based on the review finding.*

**Keywords**: *Electrical and Electronic Equipment, Electronic Waste, E-waste, Mobile Phone Waste, Reverse Logistics*

## INTRODUCTION

Today there are many aspects has been changed due to the innovation and advancing of the technology. For the past few decades many electrical and electronic equipment (EEE) has been invented in order to make our life easier and efficiency. For example, EEE like television, refrigerator, computer, mobile phone, air-conditioner, washing machine, etc. has been changing our daily life to be more convenient. Although those EEE can provide many benefits and advantages to our daily activities, however, in the meantime it will also cause very serious environmental issues for the society. This is because after the EEE reach end-of-life or it can be referred as a waste of electrical and electronic equipment (WEEE) or electronic waste (e-waste), it will affect the environment surrounding if that e-waste is not managed in an appropriate process. According to solving the e-waste problem (STEP) initiative, e-waste can be defined as all electrical and electronic equipment that discarded and its parts as a waste without the intention of reuse from the owner (Doefnaes & Kuehr, 2014).

Meanwhile, the demand for the EEE will also keep increasing dramatically in the future. Although the advancing of technology in electronic equipment has benefited the society, however, it is become harmful after their lifespan not only to the environment but also human health due to their hazardous material and unsafely disposal method. With the rapid development of the technology era, multifunction electronic equipment, and intensive competition in term of price have led to the short lifespan of the electronic equipment, especially mobile phone (Tanskanen, 2013). As a result, e-waste quantity will keep increasing continuously and the amount will also keep growing for the year coming once the EEE reach the lifespan (Tanskanen, 2013).

Although, e-waste is one of the environmental issues that most of the country concern about. However, every country is different in term of managing the e-waste. In the context of developed countries, such as Europe Unions (EU), United State of America and Japan, they have an effective legislation to monitors the process of managing the flow of e-waste. In EU, there are two main directives that monitoring on e-waste which is WEEE directive and Restriction of Use of Certain Hazardous Substances (RoHS). Besides, most of the developed countries also provided the comprehensive infrastructures concurrently with the enforcement of the legislation.

Furthermore, in developed countries, the original equipment manufacturers (OEMs) or producers are required to play their role to implement the extended producer responsibility (EPR) to take back the end-of-life EEE from the consumer (Afroz, Masud, Akhtar, & Duasa, 2013). However, there is a different scenario in the developing countries such as Malaysia, Indonesia, Thailand, etc. in managing the e-waste. There are few issues that affected the effectiveness of managing e-waste in developing countries (Afroz et al, 2013). First, the inappropriate method of disposals such as landfill and open burning. Second, lower awareness among the society in term of the e-waste hazardous material toward environmental and health. Third, the implementation of legislation by the government is not comprehensive compared to the developed countries.

Today, the consumption of EEE in developing countries is growing rapidly compared to developed countries. The increases demand toward the EEE that including a variety of product will generate huge e-waste. Besides, shortening of product lifespan and rapid technological innovation in information and communication technology products especially mobile phone are the main factors contributing to the increasing amount of e-waste globally (Balde, Wang, Huisman, & Kuehr, 2015). According to the recent official report released by United Nation University, it shows that there are approximately 41.9 million tonnes (Mt) of e-waste generated in 2014 globally and it is forecast to reach approximately 50 Mt by the year 2018 (Balde et al., 2015).

Moreover, the world population is keeping increasing. At the same time, the consumption level will also increase. Therefore, the generation of e-waste will also keep increasing parallel with the increasing of the number population in the world. The data from United Nation report indicated that the amount of e-waste will keep increasing if the world population keep increasing. Based on the report from United Nation, the amount of e-waste is estimated to be increasing 19% to reach 49.8 Mt from the year 2014 to 2018 due

to the shorter lifespan of the electronic products and the increasing of the global population (Balde et al., 2015). Besides, the report also indicated that Asia is the main contributed for the e-waste generation in the year 2014 which is 16 Mt follow by Americas and Europe which is 11.6 Mt. As a consequence, in future, there is huge demand amount for the natural resources in order to fulfil the industrialized activity to produce the EEE (Kilic, Cebeci, & Ayhan, 2015).

## OVERVIEW E-WASTE TRENDS AND ISSUES IN MALAYSIA

The e-waste issue in Malaysia is same as other developing countries such as China, Thailand, Indonesia, etc. The rapidly increasing number of the population and also the increase of the purchasing power lead to the higher demand for the EEE. Therefore, the generation of the e-waste will also increase dramatically due to the higher demand. In Malaysia, it is estimated that 1.12 Mt of e-waste will be generated through households and business institutions by the year 2020 (Department of Environment Malaysia, 2008). The growing of the e-waste will directly give an impact on the environmental and human health due to the hazardous waste from e-waste. The main factor that contributed to the increase of the e-waste in Malaysia is affordability due to increase income, higher purchasing power and rapid innovation changing in technology (Department of Environment Malaysia, 2008). Furthermore, due to the rapid changing of the technology and electronic equipment make the lifespan of the EEE become shorter. As a result, the demand for the EEE is increasing. The study conducted by Afroz et al. (2013) among household in Kuala Lumpur, Malaysia show that the main reason for updating or change their EEE is because of the new advanced technology features in the products such as mobile phone.

Furthermore, the growth of the informal recycling party in Malaysia will also affect the environment and health due to their inappropriate disposal method compare to the OEMs and producers (Afroz et al., 2013). In Malaysia, the e-waste recycling management mainly comprises of two components which are the formal recycling and informal recycling. The formal recycling company is the firm that approved by Department of Environment (DOE) Malaysia with licensed. The formal recycling company will manage the e-waste follow the regulation and guideline by DOE. However, informal recycling normally will not follow the regulation and guideline by DOE because their main purpose is to retrieve valuable material from e-waste. Therefore, they will not implement the proper technique.

During the recovery process, the informal recycling party might not dismantle the hazardous material from the EEE that will cause the environmental and public health problem. Afroz et al. (2013) explain that inappropriate managing of e-waste will affect the environment and health in three situations. First, e-waste will be disposed of with the municipal solid waste, burning in the open environment and discard arbitrarily. These actions will cause the hazardous or toxic materials in e-waste to enter the soil, groundwater, and atmosphere. Second, it happens during the dismantling process or

recovery process. Without the proper stages of dismantling process among the informal recycling party will cause the toxic to be released into the air, water and soil nearby. This will directly affect the ecosystem in that area. The third is the health of the labor. Due to the unsafely working condition, the labor might face the risk such as skin problem due to the acids from e-waste.

The other issue that occurs in Malaysia on e-waste is the collection issue. The low collection rate of e-waste will cause the issue related to the environment. This is because the disposal of the e-waste through the household waste bin finally will end up in the landfill. Besides, there is also e-waste send to the improper destination whereby the treatment location, discarding process is substandard and lack of treatment infrastructure especially in developing countries like Malaysia (Balde et al., 2015). Furthermore, there is also lacking enforcement of law again the e-waste management in some less-developed countries such as Malaysia (Agamuthu & Victor, 2011). As a result, the informal sector becomes the main treatment and recovery for the e-waste. Therefore, in order to reduce the environmental impact from the e-waste, it has to be sent to the ideal location with the proper recovery and disposal process.

Besides, producers or OEMs is also one of the crucial stakeholders or players that can reduce e-waste quantity by extending their responsibility to discard end-of-life EEE. It means the producers or manufacturers have to implement their effort and responsibility to collect or take back the end-of-life EEE from the consumer and recover it until the moment of disposal. In Malaysia context, EPR is not mandated for manufacturers in term of the collection and take back end-of-life product for recovery (Agamuthu & Victor, 2011). Therefore, there are rare producers that willing to participate in product recovery (Khor & Udin, 2013). As a result, there are not many producers that are willing to adopt reverse logistics (RL) activity and EPR voluntary because there is not compulsory according to the legislation in Malaysia. The situation is different compared to the developed countries whereby they are more concern on the environmental issue.

Furthermore in term of the legislative issues, in Malaysia, the current regulation is concentrated manage the e-waste especially from the commercial industries, compare to the household or individual. Although there are few regulations that monitor the e-waste in Malaysia, however, most of the legislation is only focus on the concept but not to enforcement (Khor & Udin, 2013). Besides, in Malaysia most of the household and individual willing to sell their e-waste to the informal collector than the formal collector (Afroz et al., 2013). It means that they are considered the economic benefit than the environmental perspective. The improper recovery process from the informal collector might harm the environmental condition compare to the formal collector, OEMs, and producer.

## OVERVIEW MOBILE PHONE WASTE TRENDS AND ISSUES IN MALAYSIA

Today, mobile phone waste has become one of the fastest growing among all the e-waste. The reason why the mobile phone waste is growing faster compared to the other e-waste is because of few factors (Soo, Featherston, & Doolan, 2013; Suja, Abdul Rahman, Yusof, & Masdar, 2014). First, the average lifespan for the mobile phone is short which is between 18 and 24 months. Second, rapid innovation in technology. Third, affordability and purchasing power among the consumer is keeping increasing. Therefore, the issue of growing generation of mobile phone waste is getting attention in Malaysia. Based on the official data published by DOE on their official website indicated that the generation of mobile phone waste and mobile phone rechargeable batteries is kept increasing year by year. Besides, the data also mention that mobile phone waste and mobile phone rechargeable batteries are the main contributors to the generation of e-waste in Malaysia compare to the other e-waste products. Based on the data, it is indicated that mobile phone waste and mobile phone rechargeable batteries are forecasted to reach 22,492,000 units and 27,513,000 units in the year 2020.

In Malaysia, the penetration rate for the mobile phone is increasing from year to year. The report released by Malaysian Communications and Multimedia Commission (MCMC) (Malaysian Communications and Multimedia Commision, 2016) and World Bank (2016) indicated that the mobile phone penetration rate in Malaysia is approximately 143% in the year 2015. The data from World Bank (2016) indicated that the mobile phone penetration rate in Malaysia is keep increasing from year 2007 to year 2015 which is 87% (2007), 101% (2008), 108% (2009), 119% (2010), 127% (2011), 141% (2012), 144% (2013), 148% (2014) and 143% (2015). Besides, mobile phone penetration rate in Malaysia also consider higher compared to some other countries. For example, in the year 2015, the penetration rate in some countries such as United State of America (117%), China (93%), Indonesia (132%), Thailand (125%), Vietnam (130%), Brunei (108%), Cambodia (133%), Singapore (146%), and so on. Higher rate shows that Malaysian is able to own more than one mobile phone. Therefore, the demand for the mobile phone will keep continues increase for the coming year. As a consequence, the generation of mobile phone waste will be growing faster in future. Besides, Malaysia government also concern on the coverage for the mobile phone. According to World Bank (2016), show that the coverage for the mobile phone in Malaysia based on the population is already achieve 96% in the year 2015. The good coverage will also encourage the increased usage of the mobile phone in the future. Table 1 and 2 shows the comparison penetration rate of the mobile phone in Malaysia and other developing and developed countries.

Table 1
Mobile Phone Subscriptions among ASEAN (per 100 people)

| Country (ASEAN) | 2008 (Year) | 2009 (Year) | 2010 (Year) | 2011 (Year) | 2012 (Year) | 2013 (Year) | 2014 (Year) | 2015 (Year) |
|---|---|---|---|---|---|---|---|---|
| Malaysia | 87% | 101% | 108% | 119% | 127% | 141% | 144% | 143% |
| Thailand | 93% | 99% | 108% | 116% | 127% | 140% | 144% | 125% |
| Singapore | 132% | 138% | 145% | 150% | 152% | 155% | 146% | 146% |
| Indonesia | 60% | 68% | 87% | 102% | 114% | 125% | 128% | 132% |
| Cambodia | 30% | 44% | 56% | 94% | 128% | 133% | 132% | 133% |
| Philippines | 75% | 82% | 88% | 99% | 105% | 104% | 111% | 118% |
| Vietnam | 85% | 111% | 125% | 141% | 145% | 134% | 147% | 130% |
| Brunei | 102% | 104% | 108% | 109% | 113% | 112% | 106% | 108% |
| Myanmar | 0.7% | 0.9% | 1.1% | 2.3% | 7% | 12% | 54% | 76% |
| Laos | 32% | 51% | 62% | 84% | 64% | 68% | 66% | 53% |

(Sources: Malaysian Communications and Multimedia Commision, 2016 and World Bank, 2016)

Table 2
Mobile Phone Subscriptions among Developed Country (per 100 people)

| Country (Developed Country) | 2008 (Year) | 2009 (Year) | 2010 (Year) | 2011 (Year) | 2012 (Year) | 2013 (Year) | 2014 (Year) | 2015 (Year) |
|---|---|---|---|---|---|---|---|---|
| Japan | 86% | 91% | 96% | 104% | 110% | 116% | 120% | 125% |
| South Korea | 95% | 99% | 104% | 107% | 109% | 110% | 115% | 118% |
| United States | 85% | 88% | 91% | 94% | 96% | 97% | 110% | 117% |
| Australia | 102% | 100% | 100% | 104% | 105% | 106% | 131% | 132% |
| United Kingdom | 122% | 123% | 123% | 123% | 124% | 124% | 123% | 125% |

(Sources: Malaysian Communications and Multimedia Commision, 2016 and World Bank, 2016)

The data from both tables clearly show that the penetration rate of the mobile phone in Malaysia is keeping increasing from the year 2008 to 2014. Although in the year 2015 the rate is decreased by 1%, it does not bring any effect to the usage of the mobile phone among Malaysian. If compare to the other countries in Southeast Asia, in the year 2015 Malaysia is the second higher in term of penetration rate which is 143%. If compare to the developed countries, the penetration rate in Malaysia still can be considered higher. Therefore, it proves that Malaysian have more than one mobile phone. As a consequence, in future, the generation of mobile phone waste will be increasing dramatically which is parallel with the claim from the data released by DOE.

Besides, according to the study conducted by Malaysian Communications and Multimedia Commission (2015) towards mobile phone user's survey in Malaysia found that the higher percentage of the user based on the age category is within 20 years old to 24 years old which is 18.8%. The second higher percentage is within 25 years old to 29 years old which is 16.3%. Therefore, sum up the percentage of 20 years old to 29 years old is 35.1%. The group from 20 years old to 29 years old is classified as a younger user according to MCMC. Finally, from the study, it shows that the higher users of the mobile phone in Malaysia are the younger user. The data on the percentage of users based on age category in Malaysia from the year 2009 to 2014 is showing in table 3.

Table 3
Percentage Distributions of Mobile Phone Users by Age Category

| Age classes 2009-2011 | 2009 | 2010 | 2011 | Age classes 2012-2014 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|
| Below 15 | 2.3% | 3.4% | 1.9% | Below 15 | 1.8% | 1.7% | 1.8% |
| 15-19 | 12.4% | 10.9% | 10.4% | 15-19 | 11.4% | 13% | 10.7% |
| 20-24 | 20% | 17.3% | 17.6% | 20-24 | 17.3% | 18.1% | 18.8% |
| 25-29 | 15.9% | 15.9% | 16.5% | 25-29 | 15.8% | 16.3% | 16.3% |
| 30-34 | 14.2% | 13.5% | 13.4% | 30-34 | 13.8% | 13.5% | 12.7% |
| 35-39 | 9.3% | 10.1% | 9.8% | 35-39 | 10.8% | 9.3% | 10% |
| 40-44 | 8.1% | 9.2% | 10.3% | 40-44 | 9.2% | 9.2% | 8.3% |
| 45-49 | 5.9% | 6.5% | 6.6% | 45-49 | 6.5% | 6% | 7.2% |
| 50 and above | 11.8% | 13.3% | 13.4% | 50-54 | 5.4% | 4.9% | 4.6% |
| | | | | 55-59 | 3.3% | 3.6% | 4.8% |
| | | | | 60-64 | 1.9% | 2.4% | 2.8% |
| | | | | 65 and above | 2.9% | 2% | 2.3% |

(Source: Malaysian Communications And Multimedia Commission, 2015)

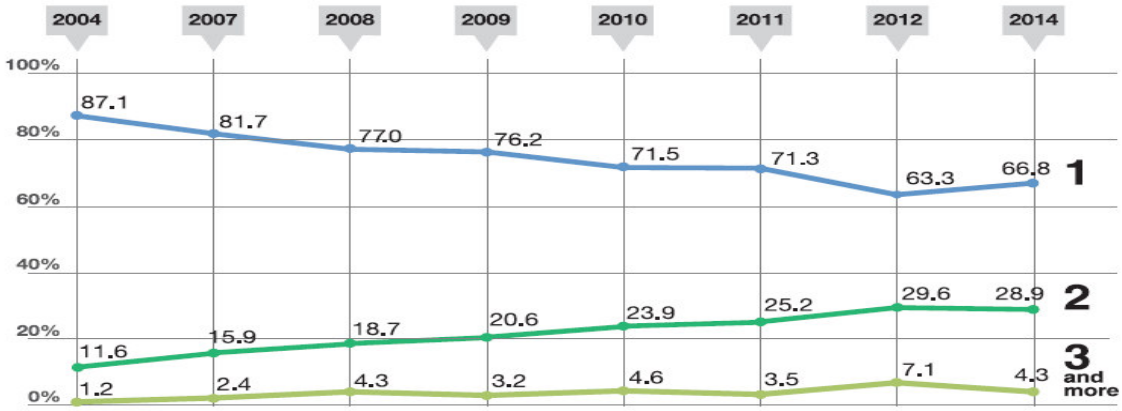


Figure 4
Trend of Mobile Phone Ownership from 2004 to 2014
(Source: Malaysian Communications And Multimedia Commission, 2015)

Meanwhile, in figure 4 above show the trend mobile phone ownership in Malaysia. In the year 2014, owning one mobile phone users is 66.8%, owning two mobile phone users is 28.9% while owning three or more mobile phone users is 4.3%. If comparing the percentage over the year, owning of two mobile phones is keep increasing from the year 2004 to 2012 while owning of one mobile phone is decrease from the year 2004 to 2012. From the study, they found that the reason influence Malaysian owning two or more mobile phones is because of the lower price of the mobile phone with the good feature in the market and also many of them still keep their old mobile phone even though purchase the new mobile phone.

## RECOMMENDATION

Based on the above data from Malaysia Communication and Multimedia Commission, Department of Environment Malaysia, World Bank and review from the past academic literature found that in the 21st century e-waste and mobile phone waste have become the critical issues and treats regardless to the environmental or human health. Therefore, in order to solve the issue, an appropriate action and strategy need to be discovered. Reverse logistics has been recognizing widely by researchers as one of the important strategy and process that can be implemented in order to handle, reduce and minimize the generation amount of the e-waste and mobile phone waste. For example, there are several multi-national companies such as Apple, Mitsubishi, Samsung, Hewlett-Packard, Dell, LG, Lenovo, Panasonic, and Toshiba has provided a free collection channel in the United States of America in order to take-back their end-of-life product through their take-back program. Besides, there is also a company like Apple provide an incentive in their take-back program in order to encourage their customer returning the end-of-life product initiative (Sthiannopkao & Wong, 2013).

Generally, reverse logistics can be explained as the collection of the end-of-life products or return products by acquisition from the consumer for the inspection stage. Then, the disposition process will be performed in order to capture the valuable material while the other will be disposed of based on the appropriate manner (Pumpinyo & Nitivattananon, 2014). This is because based on the previous studies there are several result claim that reverse logistics process or activity not only be able to recover the end-of-life products but also can bring many other benefits for the company which is cost saving, increase company performance, competitive advantage, etc. (Daugherty, Richey, Genchev, & Chen, 2005; Hu, Sheu, & Huang, 2002; Jack, Powers, & Skinner, 2010; K. Khor & Udin, 2012; Olorunniwo & Li, 2010; Tonanont, Yimsiri, Jitpitaklert, & Rogers, 2008). Although reverse logistics activity can reduce the generation of the e-waste such as mobile phone waste while bringing another benefit for the company, however, there are still many companies that unwilling to adopt reverse logistics activity in their supply chain or business process due to the end-of-life products return quantity and quality from the consumer.

Furthermore, the factor that influences and encourages consumer intention to recycle or return their e-waste or mobile phone waste also needs to be identified. This is because reverse logistics activity relying on the participation from the consumer since their return end-of-life products in term of quantity and quality will directly affect the efficiency of the implementation (Hazen, Hall, & Hanna, 2012). In Malaysia especially, most of the consumers are willing to sell their e-waste such as mobile phone waste to informal recycler rather than return them to the producer or OEMs due to the economic benefit as a return and lack of awareness on the e-waste treat to the environmental situation (Afroz et al., 2013; Chi, Streicher-Porte, Wang, & Reuter, 2011; Soo et al., 2013; Suja et al., 2014; Supian, Shah, & Mohd Yusof, 2015). Therefore, in order to ensure the effectiveness and efficiency of the reverse logistics activity implementation, there is a need for the further study of the consumer psychological behaviour perspective. Consumer behaviour needs to be discovered and study since there is still very little and rare being discussed by the literature especially from the perspective of reverse logistics (Dixit & Badgaiyan, 2016).

## CONCLUSION

Nowadays, there are many serious environmental issues that occur globally due to human activities such as open burning, inappropriate handling of hazardous substances, overexploitation of forests and so on. Therefore, as a consequence, environmental issues such as climate change, global warming, and environmental pollution has become a serious problem in the earth. Meanwhile, in the 21st century, the issue of managing e-waste has become the critical issue globally due to their rapid amount of generation from year to year especially generation of mobile phone waste. The identification of the strategy to reduce and minimize the amount of e-waste and mobile phone waste is crucial. Besides, the entire stakeholders such as government, consumer, producer, etc.

have to play their own role in order to achieve the objective of reducing and minimizing the e-waste as well as mobile phone waste quantity in an appropriate process.

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